Total No. of printed pages = 4

9/1/19

EE 131304

Roll No. of candidate | | | | | | | | | | | |

2019

B.Tech. (EE) 3rd Semester End-Term Examination

ELECTRICAL MACHINES — I

(New Regulation)

(w.e.f. 2017-2018)

Full Marks – 70 Time – Three hours

The figures in the margin indicate full marks for the questions.

Answer Question No. 1 and any *four* from the rest.

1. Answer the questions as directed : (10 × 1 = 10)

   (i) What is the working principle of a transformer?

   (ii) Write the emf equation for wave wounded dc generator.

   (iii) State the function of brushes in a dc machine.

   (iv) Define armature torque in a dc motor.

   (v) Open circuit test of single phase transformer is done to calculate ———— loss. (Fill up the blank)

[Turn over

(vi) What is the electrical characteristic curve for dc motor?

(vii) Give one application for an auto-transformer.

(viii) Define step angle of a stepper motor.

(ix) Name the different types of servo motors.

(x) Pole shoes are spreading ———— in the air gap between stator and motor of a dc machine. (Fill up the blank)

2. (a) How the dc machines are classified on the basis of field excitation? A compound generator is to supply a load of 250 lamps, each rated of 100 watt, 250 volt. The armature, series and shunt windings have resistances of 0.06 Ω, 0.04 Ω and 50 Ω respectively. Calculate the generated emf when the machine is connected in (i) long shunt (ii) short shunt. Take voltage drop per brush as 1 volt. (2 + 4 + 4 = 10)

(b) Derive the emf equation of a dc generator. (5)

3. (a) What are the various characteristics curves of dc generator? Explain briefly. (6)

(b) A 100 h.p., 500 V shunt motor has 4 poles and wave wounded with 492 armature conductors. The flux is 50 mwb per pole and the full-load efficiency 92%. The armature resistance is 0.1 Ω and field resistance is 250 Ω. Calculate for full load (i) the speed of the motor (ii) the armature torque developed and (iii) the useful torque. (3 + 3 + 3 = 9)

4. (a) Explain how Swinburne's method is applied to calculate efficiency of De machine. State merits and draw backs of this method. (4 + 2 + 2 = 8)

(b) The Hopkinson's test on two identical shunt machines gave the following results.

input voltage = 500 V

input current = 15 A

output current of generator = 12 Amp

Field current of generator = 4 Amp

Field current of motor = 3 Amp

Armature resistance of each machine = 0.06 Ω

Find the efficiency of motor and generator. (7)

5. (a) Explain how open circuit test and short circuit tests are performed to calculate various losses of a single phase transformer. Use proper circuit diagram for both tests. (4 + 4 = 8)

(b) A three phase transformer is connected to 11 kV supply and draws 6 Amp current. Determine the line voltage at the secondary side and line current in the secondary for both (i) Delta-Wye connection and (ii) Wye-Delta connection. Consider turns ratio of the transformer is 11. (3 + 4 = 7)

6. (a) What are the different types of stepper motor? Explain briefly. Define step angle and stepping rate. (5 + 2 = 7)

(b) What is commutation? What are different methods of improving commutation? Explain. (2 + 6 = 8)

7. Write short notes on any *three* of the following : (3 × 5 = 15)

(a) AC servomotor

(b) Parallel operation of transformer

(c) Brake test of DC machine

(d) Core type and shell type transformer.
